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Effect of Nitrogen Levels on Growth and Yield of Fenugreek (*Trigonella foenum graecum* L.) Grown Under Zalingei Situation

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ABSTRACT: *The research was carried out in in the nursery of the Jabel mara for rural development, Ministry of Agriculture, Central Darfur State, during November 2016 to study the response of Trigonella foenum-graecum L to nitrogen fertilizer as urea at four levels: 0, 50, 100, 150 Kg. fd-1. The experience performed using Randomize Complete Design. The results showed that increasing urea level caused an important yield in number of pods, number of seeds in a pod and total seed yield. On other hand nitrogen fertilization gave an important growth in plant height and branches number. Finally, plants which fertilized with urea at 50 and 100 kg. fd-1 gave the largest value of total seed yield compared with lowest significantly value for control.*

KEY WORDS: *trigonella foenum-graecum*, fertilization, urea.

INTRODUCTION

Medicinal plants are used by more than 80 % of the world population especially in developing countries to cure and improve the general health and health performance, principally due to the common belief that plant-derived drugs are without any side effects along with being economical and locally accessible (Vuorelaa et al., 2004). Fenugreek, *Trigonella foenum-groecum* L., is an annual herb grown in various countries around the world. It was thought to be indigenous to the countries bordering on the eastern shores of the Mediterranean, but now is widely cultivated in India, China, northern and eastern Africa, and parts of Europe and Argentina (Parthasarathy et al., 2008); (Basu, 2004). The health promoting property of fenugreek has been long documented when it is taken as vegetables, food supplements or medicinal remedies. It has been used in many different cultures, but especially in Asia and the Mediterranean region (Passano, 1995).

Fenugreek seeds yield can be significantly increases in quantity and as well as quality through the suitable management of cultivation, irrigation and harvesting. In this context, fenugreek (*Trigonella foenum graecum L.*), is an annual legume and extensively cultivated in most regions of the world for its medicinal value as well as spices [Petropoulos, 2002]. Fenugreek seeds contain chemical compounds which are highly valued in the cosmetics industry. Akhtar et al. (2010) reported that cream bases and cream formulations containing fenugreek seed extract substantially

improved skin elasticity, hydration and skin's ability to resist photo-aging. Fenugreek seeds are a natural source of vitamins such as thiamine, biogenic elements such as Fe, Si and Na, and a rich source of P and S (El Nasri and El Tinay, 2007). In the research conducted by Kochhar et al. (2006), fenugreek seeds contained 25.8% crude protein and 6.53% oil. Seed DM had the following chemical composition: 3% ash, 6.28% crude fiber and 58.13% total carbohydrates. El Nasri and El Tinay (2007) estimated the protein content of fenugreek seeds at 28.4%, crude fiber at 9.3% and crude fat at 7.1%. The fatty acid profile was dominated by unsaturated acids: oleic, linoleic, and alpha-linolenic acids which accounted for 16.3%, 50.0% and 24.4% of total fatty acids, respectively. The unique mineral and organic properties of fenugreek are exploited in the production of functional and nutritional foods as well as nutraceuticals and cosmetics (Hooda and Jood, 2005; Lubbe and Verpoorte, 2011).

Using nitrogen in fenugreek leads to growth increase, deferred maturation, producing good leaves, developed stem and the plants' luxuriant dark-green color which indicates a desired growth. Also, plant density on the row and within the rows affects the yield and is controlled by the seed rate [Petropoulos, 2002]. Results from fenugreek cultivation after harvesting rice in Mazandaran province (North of Iran) showed that upon using nitrogen fertilizer in the form of 100kg ha urea, the highest yield was obtained [Seilsepor and Momayezi, 2004]; [Rathore and Manohar, 1989] found that in a winter crop of fenugreek on loamy sand soils, seed and forage yields were higher with 20 kg NhaG and 50 kg P haG. Thapa and Maity [2003] reported that applying 50 kg N haG could be effective in increasing the yield. Billaud and Adrian [2001] suggested using 60 kg N haG and 40kg K O haG for fenugreek cultivation.

Nitrogen is essential for vegetative growth of the plant resulting in higher green and seed yield (Tehelan and Thakral, 2008; Tunctruk et al., 2011). Increased addition of nitrogen usually results in increased yield of crop plant (Korus and Lisiewska, 2009). Productivity of the crop is low but may be increased with supply of optimum amounts of fertilizer and improved agronomic practices.

The aim of this research was to investigate the effect of various rates of nitrogen fertilizer as well as effect of planting density on yield and yield components of fenugreek in Zalingei.

MATERIALS AND METHODS

Seeds of *Trigonella foenum-groecum* L.,were obtained from Zalingei agricultural service shop, Central Darfur State and the study was conducted at the farm of Jabel mara project for rural development, Ministry of agriculture, Central Darfur, Sudan, during 2016 to investigate the effect of nitrogen fertilizer on growth yield of fenugreek.

Experimental design

The experiment was laid out as Complete Randomized Block Design. This includes three treatments which were: the seed rate treated with for nitrogen applications (N1, N2, N3 and N4).

Data collection:
The plants were assessed for growth and yield parameters: plant height, number of branches, number of seed per fruit, yield per feddan. .

Statistical Analysis:
The data collected were subjected to one-way analysis of variance (ANOVA) and the means were separated at $P \leq 0.05$ using LSD Multiple Range Test. All statistical analyses were done using statistics software, 2003.

RESULT AND DISCUSSION

Among the means for growth and yield component parameters Table), revealed that for growth components the highest amount for plant height and number of branches were found in the greater amount of nitrogen application. While the lowest amount of pods, seeds and yield were recorded with zero nitrogen application s. All the statistical analysis showed significant result according to LSD multiple test range at 0.05. Effect of N (nitrogen) on yield attributes of Fenugreek has been observed earlier by [(Sharma, 2000), (Khashmelmous,1977)]. According to the results in Table 2, a highly significant ($P<0.05$) effect of plant density on biological yield at the full maturity stage was observed in this study (Table 2), with regards to the effect of different nitrogen rates and plant density on the agronomic traits and also the development of shoots, Toghraei *et al.* (2009) showed that, increased vegetative growth and developed shoots, were followed by increased biological yield as a result of more nitrogen application. Also, Forawi and Elsheikh (1995) in their study found that N-fertilization significantly increased the dry matter production and plant nitrogen content. Increasing the amount of nitrogen fertilizer more than suitable amount can decrease the total and economically can cause waste of money.

Table (1): Proximate Nutritive Values of Fenugreek seeds

Parameter	Mean ± S. D. (% or g/100g dry weight)
dry matter	91.11
organic matter	87.88
Crude protein	29.49
Crude fiber	25.8
ether extract	3.86
cellulose	6.20
crude ash	3.23
nitrogen-free extract	48.33
acid detergent fiber	11.50
neutral detergent fiber	14.44
acid detergent lignin	2.61
oil	6.53
Carbohydrates	58.1
metabolizable energy	2373.67

(Taskin et al., 2016)

Table (2): Showed the effect of Nitrogen applications on growth and yield:

Nitrogen	Plant height	Branches	Pod	SEED/pod	Yield
N4	45.800 A	3.8667 A	14.627 AB	9.453 B	3.5067 A
N3	41.753 B	3.4667 AB	15.433 A	10.667 A	3.8000 A
N2	39.320 B	3.2000 B	13.433 B	9.560 B	3.4633 A
N1	36.257 C	2.7000 C	11.517 C	8.367 C	2.8567 B
LSD	1.15	0.20	1.43	0.57	0.5744

CONCLUSIONS

In conclusion, we suggest that, simultaneous Application of nitrogen fertilizer can significantly improve both seed and biological yield under irrigation condition in temperate climates. However, further confirmation of the trends seen in this experiment needs to be obtained before more specific recommendations can be made.

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